REMARKS:

1) In view of the accompanying Request for Continued Examination (RCE), the Final Status of the Office Action of May 1, 2009 shall be withdrawn, and the examination shall be continued based on the present amendments and remarks.

2) Claims 13 to 16 have been canceled. Claim 17 has been amended to recite additional features of the invention supported in the original disclosure at page 7 lines 1 to 21, page 10 lines 1 to 27, and Figs. 7 and 8. Thus the amendments of claim 17 do not introduce any new matter. New claims 18 to 33 have been added to recite additional features of the invention. Claims 18 to 28 depend from claim 17. Claim 29 is a new independent claim directed to a method of making an abradable shroud lining for a gas turbine engine. Claims 30 to 33 depend from claim 29. The new claims are supported by the original disclosure as shown in the following table, and do not introduce any new matter. Entry and consideration of the claim amendments and the new claims are respectfully requested.

new claims	18	19	20	21	22	23
original support	Figs. 7, 8	Cl 15, 16; P 10 L 16-18	Cl 15, 16; P 10 L 16-18	Cl 17; P 10 L 4-16	Cl 13	Figs. 7, 8 P 10 L 1-4, 19-20

new claims	24	25	26	27	28	29
original support	Cl 14; Fig. 7	P 6 L 8-9	P 6 L 8-9	P 8 L 9-11	P 6 L 11-12	P 6 L 4 - P 7 L 21; . Fig. 1

new claims	30	31	32	33
original support	P 6 L 12-13	P 6 L 8-9	P 7 L 20-21; P 10 L 16-18	P 7 L 18-20

3) Referring to pages 2 to 4 of the Office Action, the rejection of claims 13 to 17 as obvious over US Patent 3,825,364 (Halila et al.) in view of US Patent 6,062,813 (Halliwell et al.) is respectfully traversed.

Claims 13 to 16 have been canceled. Claim 17 has been amended to recite additional distinguishing features of the invention.

According to claim 17, the abradable shroud lining comprises an open-pored metal foam component that is connected to a carrier. The metal foam component comprises an open-pored metal foam produced by foaming expansion of a melted metal powder. This "product-by-process" limitation must be considered insofar as it imposes a structural characteristic on the metal foam (see MPEP 2113). The character or nature of the open-pored metal foam is influenced by how it was produced, namely by foaming expansion of a melted metal powder. For example, the open pores have features (e.g. shape, size, open porosity, etc.) that result from and are characteristic of such foaming expansion of a melted metal powder. This is a different nature or character of pores in comparison to a simple sintered metal, which may also have open pores but the nature of the pores is different, as can be determined by inspection of the inventive metal foam in comparison to a simple sintered metal.

Further according to present claim 17, the metal foam component has a front surface at which the metal foam is bare and exposed so that the seal fins or the blade tips of the rotor blades directly graze the metal foam. The metal foam component further has a back surface opposite the front surface, by which the metal foam component is rigidly connected surfacially along the back surface thereof onto a carrier surface of the carrier. For example as shown in present Figs. 7 and 8, the carrier 29 thereby surfacially supports and carries the metal foam component 28 continuously along the back surface of the metal foam component 28. This provides continuous surfacial support for the otherwise fragile and weak open-pored metal foam produced by foaming expansion of a melted metal powder.

Still further according to present claim 17, the carrier has holes passing therethrough and opening through the carrier surface to allow gas communication through the holes and from the holes directly into the back surface of the metal foam component. This emphasizes that the back surface of the metal foam component is surfacially connected directly onto the carrier surface of the carrier, so that the holes of the carrier open directly onto the back surface of the metal foam component.

Contrary to the presently claimed arrangement, the porous sintered metal shroud liner 18 of Halila et al. is not rigidly connected surfacially along a back surface thereof onto a carrier surface of the carrier 27. Instead, there is purposely an annular plenum space 25 formed between the carrier 27 and the porous shroud liner 18 (see Fig. 2 and col. 6 lines 28 to 32). Thus, the carrier 27 in the structure according to Halila et al.

does not provide continuous surfacial support for the sintered metal shroud liner 18.

The above structural distinction is significant, because the sintered metal shroud liner 18 of Halila et al., while being somewhat porous, is not an open-pored metal foam produced by foaming expansion of a melted metal powder. Instead, it is simply porous sintered metal (abstract and col. 5 lines 47 to 64). A simple sintered metal is regarded as being less porous, more dense, and therefore more rigid and self-supporting than an open-pored metal foam produced by foaming expansion of a melted metal powder. In the invention, this foaming expansion is achieved by mixing a propellant such as titanium hydride with the metal powder, so that when the metal powder is melted, the propellant undergoes a gas evolution reaction that produces a foaming expansion of the melted metal powder (see page 6 lines 4 to 25). This is a distinct process and results in a distinct product, in comparison to the preparation of a simple porous sintered metal according to Halila et al. Because the material of the abradable shroud lining is different, the supporting structure thereof must also be different, as discussed above.

Regarding the use of a metal foam as a porous abradable material of a turbine gas seal, the Examiner has additionally cited US Patent 3,126,149 (Bowers Jr. et al.), US Patent 6,412,541 (Roesler et al.) and US Patent Application Publication 2003/0107181 (Wieghardt). While these references generally refer to a "metal foam", they do not specify that this metal foam is produced by foaming expansion of a melted metal powder, so as to form open pores that allow gas communication through the

open-pored metal foam. According to Bowers Jr. et al., the gas seal lining comprises a foamed material 16 of a mixture of aluminum and sodium silicate received in a honeycomb support structure 15 without gas-communication holes therethrough (col. 2 lines 35 to 46, col. 3 lines 16 to 41, and Figs. 1 and 3). According to Roesler et al., a polymer foam and a wax model are immersed in a ceramic material so as to form a porous ceramic casting mold, or a ceramic insert is prefabricated from a polymer foam with an open cell structure (col. 1 lines 49 to 67). Then the cooling system structure may be filled with an open cell metal foam produced by pouring a liquid metal alloy into the porous casting mold (col. 4 line 1 to col. 5 line 3). Thus, the porous metal foam is produced by copy-molding the porous ceramic mold that was formed based on a polymer foam. Roesler et al. expressly point out that this type of production avoids porosity of the metal alloy itself in the metal foam, because the melted alloy is simply poured and distributed uniformly in the open cell structure of the ceramic casting mold that was formed by the polymer foam (col. 4 line 65 to col. 5 line 3). Thus, Roesler et al. purposely avoid forming pores in the melted metal alloy itself, and do not provide a foaming expansion of the melted metal alloy itself. The resulting structure is different, because the pores have the characteristics of polymer foam pores, rather than open pores formed by foaming expansion of a melted metal powder. Wieghardt discloses that the porous abradable coating is applied by spraying on a metallic foamed material, or the coating contains a mixture of a mineral and a metallic component and a gasifiable or vaporizable component (paragraph

0010), such that the resulting coating is a metal foam for example (paragraph 0023). While the additional references have the abradable layer arranged surfacially on a support structure, the abradable materials are not bare and exposed (in Roesler et al.), or do not communicate in an open-pored manner with holes passing through the support structure (Bowers Jr. et al. and Wieghardt). Thus, even a combined consideration of Bowers Jr. et al., Roesler et al. and Wieghardt together with Halila et al. would not have suggested the presently claimed arrangement of a metal foam component comprising an open-pored metal foam produced by foaming expansion of a melted metal powder, with a back surface of the metal foam component rigidly connected surfacially along the back surface onto a carrier surface of the carrier.

The Examiner has further applied Halliwell et al. for disclosing the provision of seal fins on the outer blade tips of the rotor blades, cooperating with a stepped contour of an abradable shroud lining. The seal fins are no longer a mandatory element of claim 17, and are not necessary for patentability. Nonetheless, it is noted that the arrangement of Halila et al. does not use seal fins that cut into the porous sintered metal material, but rather merely the rotor blade tips graze along the porous sintered metal material. On the other hand, in Halliwell et al., the seal fins do not cut into a porous gas-permeable material, but rather an abradable layer of a filled honeycomb material (col. 4 line 67 to col. 5 line 2). Thus, from these teachings, a person of ordinary skill in the art would not have any knowledge, suggestion, or reasonable expectation of success by combining the seal fins of Halliwell et al. with a porous

metal material of Halila et al., because it would not have been known how the seal fins would interact with the porous sintered metal. The concern of Halila et al. is that the grazing rotor blade tips tend to "smear" the porous metal material, but such a concern does not apply to the seal fins of Halliwell et al., because the seal fins cut into the abradable material rather than merely smearing along the abradable material.

For the above reasons, even a combined consideration of all of the references would not have made the invention of present independent claim 17 obvious. The Examiner is respectfully requested to withdraw the rejection.

4) The new dependent claims 18 to 28 recite additional features that further distinguish the invention over the prior art, for example as follows.

Claim 18 recites that the entire back surface of the metal foam component and the entire carrier surface each extend along respective straight axial lines on respective cylindrical contours. This distinguishes from stepped or sloping or discontinuous back surface contours in the prior art.

Claim 19 recites that the inventive arrangement further comprises a glue that rigidly surfacially connects the entire back surface of the metal foam component onto the carrier surface of the carrier. This further emphasizes the continuous surfacial connection and support of the back surface of the metal foam component onto the carrier surface of the carrier. Such a glued surfacial connection is not disclosed or suggested in the prior art.

Claim 21 positively recites that the seal fins are provided on the radially outer blade tips of the rotor blades and graze into the metal foam of the metal foam component. As discussed above, this distinguishes over Halila et al., even when further considered in view of Halliwell et al.

Claims 22 and 23 recite that the metal foam component consists of a single uniform monolithic component of the metal foam, which distinguishes over prior art arrangements with multiple layers or multiple parts.

Claim 24 distinguishes the inventive stepped surface contour of the metal foam component over prior art porous metal components with a flat linear contour. While a stepped surface contour was demonstrated in Halliwell et al. for a solid non-gas-permeable abradable structure, there is no disclosure of an open-pored porous metal foam with such a stepped contour.

Claims 25 to 28 recite particular materials of the open-pored metal foam, which have not been demonstrated in the prior art.

5) New claims 29 to 33 are directed to a method of making an abradable shroud lining for a gas turbine engine, reciting particular method steps, for example as disclosed at page 6 line 4 to page 7 line 21 in connection with Fig. 1 of the drawings. Such a method of making an abradable shroud lining including an open-pored metal foam component has not been demonstrated in the prior art. The dependent claims 30 to 33 recite additional method features that further distinguish the inventive method over the prior art.

6) Favorable reconsideration and allowance of the application, including all present claims 17 to 33, are respectfully requested.

Respectfully submitted,

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Enclosures:
Transmittal Cover Sheet
RCE
Form PTO-2038

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